DEPOSITION OF (U)NCD FILMS USING HOT-FILAMENT CVD

Paul W. May

School of Chemistry, University of Bristol, Bristol BS8 1TS, U.K.

Keywords: nanocrystalline diamond, hot filament CVD, $Ar/CH_4/H_2$ gas mixtures.

Abstract

$Ar/CH_4/H_2$ gas mixtures have been used in an attempt to deposit nanocrystalline and ultrananocrystalline diamond films using hot filament CVD. It was found that the standard gas mixtures of ~1%H_2 in 1%CH_4/Ar that are used successfully to grow UNCD films in microwave plasmas produce no film growth in a HF system. This is due to the carbon content of the gas being adsorbed onto the filament producing a thick graphitic covering, which rapidly reduces the efficiency of the filament inhibiting film growth. Increasing the H_2 content in the gas mixture improves the situation, but NCD was grown successfully only for H_2 concentrations above 40%, which more closely resemble the gas mixtures used for conventional microcrystalline CVD. These results will be discussed in terms of the implications for growth mechanisms of (U)NCD.